

2004 GALVESTON BAY INVASIVE SPECIES RISK ASSESSMENT  
INVASIVE SPECIES SUMMARY

Created by: Environmental Institute of Houston, University of Houston-Clear Lake  
and the Houston Advanced Research Center

<b>Common Name:</b> Asian clam
<b>Latin Name:</b> <i>Corbicula fluminea</i>
<b>Category:</b> Aquatic Animal
<p><b>Place of Origin:</b>  “Asian clams naturally occur in southeast China, Korea, and in the Ussuri Basin, southeastern Russia (Lachner et al., 1970).”  <a href="http://www.gsmfc.org/nis/nis/Corbicula_fluminea.html#range">http://www.gsmfc.org/nis/nis/Corbicula_fluminea.html#range</a> (Accessed 12 March 2003).</p> <p>“...tropical southern Asia west to the eastern Mediterranean; Africa, except in the Sahara desert; southeast Asian islands south into central and eastern Australia (Morton 1986).”</p>
<p><b>Place of Introduction:</b> Columbia River near Knappton, Washington (Counts 1986) -  <a href="http://nas.er.usgs.gov/mollusks/docs/co_flumi.html">http://nas.er.usgs.gov/mollusks/docs/co_flumi.html</a> (Accessed 12 March 2003).</p>
<p><b>Date of Introduction:</b> 1938 - <a href="http://nas.er.usgs.gov/mollusks/docs/co_flumi.html">http://nas.er.usgs.gov/mollusks/docs/co_flumi.html</a> (Accessed 12 March 2003).</p>
<p><b>States Effected:</b>  “This species is found in fresh waters throughout the United States including all five Gulf states and northern Mexico (Dundee, 1974; Carlton, 1992). Estuarine populations have been reported for the San Francisco Bay, California and Chesapeake Bay, Virginia, but none have been reported for the Gulf of Mexico ecosystem (Carlton, 1992).”  <a href="http://www.gsmfc.org/nis/nis/Corbicula_fluminea.html#range">http://www.gsmfc.org/nis/nis/Corbicula_fluminea.html#range</a> (Accessed 12 March 2003).</p> <p>“Since the introduction of <i>Corbicula fluminea</i> to the United States in 1938, it has spread into many of the major waterways. The following location information briefly outlines where it is presently found. The [date: author publication date] format associated with each state identifies the first collection or record of <i>C. fluminea</i> in that state. The Asian clam has become established in the following states: <b>Alabama</b> [1962: Hubricht 1963] widespread (Counts 1991); <b>Arizona</b> [1958: Dundee and Dundee 1958] in the Aqua Fria, Colorado, Gila, Salt, and Verde rivers; Lake Martinez; and in several irrigation systems in Maricopa County (Counts 1991); <b>Arkansas</b> [1970: Fox 1970] widespread (Counts 1991); <b>California</b> [1945: Hanna 1966] in the Sacramento and San Joaquin drainages; Santa Barbara County south to San Diego County and west to the Salton Sea (Counts 1991); <b>Colorado</b> [1995: Livo 1996] in a northwestern reservoir; <b>Connecticut</b> [1990: Morgan, pers. comm.] in the Connecticut River; <b>Delaware</b> [1986: Counts 1986] in the Delaware River in New Castle County; the Nanticoke River in Sussex County; and the Nanticoke Wildlife Refuge (Counts 1991); <b>District of Columbia</b> [1979: Dressler and Cory 1980] in the Potomac River; <b>Florida</b> [1964: Heard 1964] widespread (Counts 1991; J. D. Williams pers. comm. 1996); <b>Georgia</b> [1971: Sickel 1973] widespread (Counts 1991); <b>Hawaii</b> [1982: Devick 1991] on the islands of O’ahu, Kaua’i, Maui, and Hawaii; <b>Idaho</b> [1959: Ingram 1959] in the Snake River on the Idaho-Washington state line; <b>Illinois</b> [1962: Fetchner 1962] in the Illinois River south to the state line (Counts 1991); <b>Indiana</b> [1962: Fox 1969] in the White, lower Wabash, and Blue river drainages; Big Indian and Indian Creeks; and the Ohio River in Clark and Posey Counties (Counts 1991); <b>Iowa</b> [1974: Eckblad 1975] in the Mississippi River near Lansing; and the Cedar River in Linn County (Counts 1991); <b>Kansas</b> [1983: Mackie and Huggins 1983] in Perry Reservoir on the Delaware River; the Kansas River drainage; the North Fork of the Ninnescah River; Wilson Reservoir on the Saline River; and Cedar Bluff Reservoir on the Smoky Hill River (Counts 1991); <b>Kentucky</b> [1957: Sinclair and Isom 1961] widespread (Counts 1991); <b>Louisiana</b> [1961: Stein 1962] in the Pearl, Atchafalaya, Mississippi, and upper Red drainages (Counts 1991); <b>Maryland</b> [1975: Stotts et al. 1977] in the Choptank River near Goldsboro; Nassawango Creek near Snow Hill; the Susquehanna River below Conowingo Dam; the Wicomico River at Salisbury; the Potomac River in Charles, Prince Georges, and Montgomery Counties; Chesapeake Bay at Havre-de-Grace, and near the mouth of the Susquehanna River (Counts 1991); <b>Michigan</b> [1981: Clarke 1981] in Lake Michigan at the J. H. Campbell Power Plant; and Lake Erie at Detroit Beach, Sterling State Park and Bolles Harbor (Counts 1991); <b>Minnesota</b> [1975: Cummings and Jones 1978] in the Minnesota River near Burnsville; <b>Mississippi</b> [1963: Heard 1966] widespread (Counts 1991); <b>Missouri</b> [1969: Fox 1969] in the lower Missouri River drainage south to the state line; <b>Nebraska</b> [1991: Peyton and Maher 1995] in the Platte River in Lincoln and Dawson Counties; <b>Nevada</b> [1959: Ingram 1959] in Lake Meade (Counts 1991); <b>New Jersey</b> [1973: Fuller and Powell 1973] in the Raritan River in Middlesex and Somerset Counties; and the Delaware River near Newbold Island, Wright Point, and Trenton (Counts 1991); <b>New Mexico</b> [1966: Metcalf 1966] in Nemexas-West Drain in Dona Ana Co.; the Pecos River impoundment at Riverside Drive in Carlsbad; and the Rio Grande River from Caballo and Elephant Butte reservoirs, south to Percha Dam (Counts 1991); <b>New York</b> [1983: Raeihle 1983] in Massapequa Lake on Long Island; <b>North Carolina</b> [1970: Fox 1971] in the Cape Fear, Catawba, Chowan, Eden, Little, Meherrin, Neuse, Roanoke, Rocky, Tar, Uwharrie, and Waccamaw rivers; and Richardsons Creek (Counts 1991); <b>Ohio</b> [1962: Pojeta 1964] in the Muskingum, upper Scioto, and upper Great Miami drainages; and the lower Hocking River (Counts 1991); <b>Oklahoma</b> [1969: Clench 1971] in the Arkansas River from Cherokee to Wagoner Counties; the Little River near Goodwater; Lake Texoma on the Red River; Lake Overholser; Lake Thunderbird; and Caddo Creek in Carter County (Counts 1991); <b>Oregon</b> [1948: Ingram 1948] in the</p>

Columbia drainage; the John Day River; the Smith River near Scottsburg; and at the mouth of the Siuslaw and Willamette rivers (Counts 1991); **Pennsylvania** [1973: Fuller and Powell 1973] in the Ohio and Delaware rivers; the Beaver River in Beaver County; the Monongahela River at Lock and Dam Number 8; and the Schuylkill River at the Limerick Power Station and Fairmount Dam (Counts 1991); **South Carolina** [1972: Fuller and Powell 1973] in the Savannah, Cooper, Santee, Pee Dee, Little Pee Dee, Edisto, Waccamaw, and Salkahatchie rivers; the intracoastal waterway; and several industrial facilities in Aiken and Pickens counties (Counts 1991); **Tennessee** [1959: Sinclair and Isom 1961] in the Tennessee drainage (Counts 1991); **Texas** [1964: Metcalf 1966] in the Angelina, Colorado, Rio Grande, Guadalupe, San Antonio, San Jacinto, Sabine, Red, White, and Brazos drainages; the Clear and West Forks of the Trinity River (Counts 1991); **Utah** [1975: Counts 1985] in Sevier Reservoir; **Virginia** [1968: Diaz 1974] in the Appomattox, Clinch, Potomac, James, and New rivers; Lake Anna; the Chowan River at the mouths of the the Blackwater and Nottoway rivers; and the Chickahominy River at Lanexa; (Counts 1991); **Washington** [1938: Burch 1944] in the Columbia, Snake, Chehalis, and Willapa rivers; Hood Canal in Jefferson County; and Aberdeen Lake in Grays Harbor Lake County (Counts 1986, 1991); **West Virginia** [1964: Thomas and MacKenthum 1964] in the Elk and Kanawha drainages (Counts 1991); **Wisconsin** [1977: Cummings and Jones 1978] in the Mississippi River near Prairie du Chien and La Cross; and the St. Croix River near Hudson (Counts 1991).” [http://nas.er.usgs.gov/mollusks/docs/co\\_flumi.html](http://nas.er.usgs.gov/mollusks/docs/co_flumi.html) (Accessed 12 March 2003).

#### **Growth/Size:**

“Asian clams are small bivalves which typically can be found at high densities and have a relatively high growth rate (Stites et al., 1995). Maximum Asian clam density has been reported to vary between 1000/m<sup>2</sup> (Gottfried and Osborne, 1982; Stites et al., 1995) to 6000/ft<sup>2</sup> (Sinclair, 1971a) and even 25,000/ft<sup>2</sup> (Sinclair, 1971b). Life span varies according to habitat, with a maximum life span of approximately 7 years (Hall, 1984).”... In North America, Asian clams breed from spring to fall. Reproductive activities are typically highest in the fall (Kraemer and Galloway, 1986). Asian clams are synchronous hermaphrodites and incubate their young within the inner demibranch of the ctenidium (branchial cavity). Self-fertilization may occur (Kraemer and Galloway, 1986). Sperm is ejected through the exhalent siphons (King et al., 1986). Egg cells are 120 to 170 µm in diameter just prior to fertilization (King et al., 1986). Trocophore larvae develop after 14 hours. Pediveligers are released from the parent in 4-5 days (King, 1979). Approximately between 320 (fall) and 387 (spring) pediveligers are released daily per clam (Gottfried and Osborne, 1982; Hall, 1984). Larval density has been reported to be as high as 1,000/ml (Sinclair, 1971b). When the pediveligers are between 1.0 and 1.5mm in shell length, they attach to appropriate substrates with their byssus (Hall, 1984; Kraemer and Galloway, 1986). Larvae spawned in late spring and early summer may reach sexual maturity by the fall (Hall, 1984; King et al., 1986).

**Maximum Size:** This species may grow to between 50 and 65 mm in shell length (Hall, 1984). However, individuals above 25 mm are typically uncommon (Gottfried and Osborne, 1982).” [http://www.gsmfc.org/nis/nis/Corbicula\\_fluminea.html#range](http://www.gsmfc.org/nis/nis/Corbicula_fluminea.html#range) (Accessed 12 March 2003).

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**Feeding Habits/Diet:** Trophic Interactions: Asian clams are consumed mainly by fish and crayfish. In Florida, they have been reported as major prey items for the following species of fish: Redear sunfish, *Lepomis microlophus*, spotted bullhead, *Ameiurus serracanthus* (Bass and Hitt, 1974), bluegill, *Lepomis macrochirus*, spotted sucker, *Minytrema melanops*, sturgeon, *Accipenser spp.*, channel catfish, *Ictalurus punctatus*, common carp, *Cyprinus carpio*, freshwater drum, *Aplodinotus grunniens*, smallmouth buffalo, *Ictiobus bubalus*, black buffalo, *I. niger*, and blue catfish, *Ictalurus furcatus* (McMahon, 1983). [http://nas.er.usgs.gov/mollusks/docs/co\\_flumi.html](http://nas.er.usgs.gov/mollusks/docs/co_flumi.html) (Accessed 12 March 2003).

**Habitat:** *Corbicula fluminea* is found both in lotic and lentic habitats over its native range in southeastern Asia. In the United States it has been most successful in well oxygenated clear waters (Belanger et al., 1985; Stites et al., 1995)... Fine clean sand, clay, and coarse sand are preferred substrates, although this species may be found in lower numbers on most any substrate (Gottfried, and Osborne, 1982; Belanger et al., 1985; Blalock and Herod, 1999). Gottfried and Osborne (1982) reported density as lowest on bottoms composed of silty organic sediments.

**Salinity Tolerance:** Asian clams can tolerate salinities of up to 13ppt for short periods of time. If allowed to acclimate, they may tolerate salinities as high as 24ppt (King et al., 1986). Optimum is at lower salinities (Morton and Tong, 1985). In nature, Asian clams occur mostly in freshwaters, however, they have been reported from brackish and estuarine habitats, but are typically not as abundant in such habitats as in freshwaters (Carlton, 1992).

**Temperature Tolerance:** This species appears to tolerate low temperatures well. Janech and Hunter (1995) reported a viable population surviving temperatures of 0-2°C over winter in the Clinton River, Michigan (Janech and Hunter, 1984). Reproduction, on the other hand, is limited by low temperatures since veligers are typically released at temperatures of 16°C or higher (Hall, 1984).” [http://www.gsmfc.org/nis/nis/Corbicula\\_fluminea.html#range](http://www.gsmfc.org/nis/nis/Corbicula_fluminea.html#range) (Accessed 12 March 2003).

**Attitude (aggressive, etc.):**

“Because of their reproductive success and high infestation, this species has become a serious pest throughout the United States, especially in irrigation and drainage canals, as well as water distribution and industrial water use systems (Lachner et al., 1970; Sinclair, 1971a; Sinclair, 1971b; Mattice, 1977; Hall, 1984; Kraemer and Galloway, 1986; Stites et al., 1995). Given the high growth and production rates of this species, concerns have been raised over the capacity Asian clams have to alter trophic and nutrient dynamics of aquatic systems, and to displace native bivalves (Gottfried and Osborne, 1982; Stites et al., 1995). In addition, Asian clams appear to be capable of tolerating polluted environments better than many native bivalves (Jenkinson, 1979).” [http://www.gsmfc.org/nis/nis/Corbicula\\_fluminea.html#range](http://www.gsmfc.org/nis/nis/Corbicula_fluminea.html#range) (Accessed 12 March 2003).

**Physical Description:**

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“small light-colored bivalve with shell ornamented by distinct, concentric sulcations, anterior and posterior lateral teeth with many fine serrations. Dark shell morphs exist but are limited to the southwestern United States. The light-colored shell morph has a yellow-green to light brown periostracum and white to light blue or light purple nacre while the darker shell morph has a dark olive green to black periostracum and a deep royal blue nacre (McMahon 1991).” [http://nas.er.usgs.gov/mollusks/docs/co\\_flumi.html](http://nas.er.usgs.gov/mollusks/docs/co_flumi.html) (Accessed 12 March 2003).

**References (includes journals, agency/university reports, and internet links):**

1. GSMFC - [http://www.gsmfc.org/nis/nis/Corbicula\\_fluminea.html#range](http://www.gsmfc.org/nis/nis/Corbicula_fluminea.html#range)
2. USGS - [http://nas.er.usgs.gov/mollusks/docs/co\\_flumi.html](http://nas.er.usgs.gov/mollusks/docs/co_flumi.html)

**Available Mapping Information:**

USGS - [http://nas.er.usgs.gov/mollusks/docs/co\\_flumi.html](http://nas.er.usgs.gov/mollusks/docs/co_flumi.html)